OPTICAL ZEEMAN SPECTROSCOPY OF CALCIUM FLUORIDE, CaF.

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Recently laser cooling has been demonstrated for the diatomic radical calcium fluoride, CaF[b]. The mechanism of magneto-optical trapping for diatomic molecules has been elucidated recently by Tarbutt[c] where a rate model was used to model the interaction of molecules with multiple frequencies of laser light. It was shown that the correct choice of laser polarization depends on the sign of the upper state magnetic g-factor. The magnetic tuning of the low rotational levels in the $X^2\Sigma^+$, $A^2\Pi$ and $B^2\Sigma^+$ electronic states of CaF, have been experimentally investigated using high resolution optical Zeeman spectroscopy of a cold molecular beam sample. The observed Zeeman-induced shifts and splittings were successfully modeled using a traditional effective Hamiltonian approach to account for the interaction between the (ν=0) $A^2\Pi$ and (ν=0) $B^2\Sigma^+$ states. The determined magnetic g-factors for the $X^2\Sigma^+$, $A^2\Pi$ and $B^2\Sigma^+$ states are compared to those predicted by perturbation theory.

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[b]V. Zhelyazkova, A. Cournol, T.E. Wall, A. Matsushima, J.J. Hudson, E.A. Hinds, M.R. Tarbutt and B.E. Sauer, Phys. Rev. A 89, 053416 (2014)

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